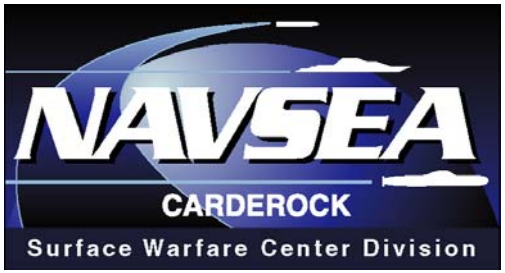

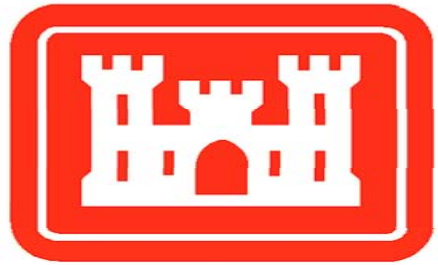

Entrance Channel Design Tool

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Background

- Corps of Engineers designs entrance channels for the nation's ports and harbors
- Underkeel clearance a major factor in channel design
- US Navy developed Environmental Monitoring and Operator Guidance System (EMOGS) to assist deep draft Navy ships transiting shallow channels
- EMOGS predicts underkeel clearance before the ship transits the channel

Corps of Engineers Requirements

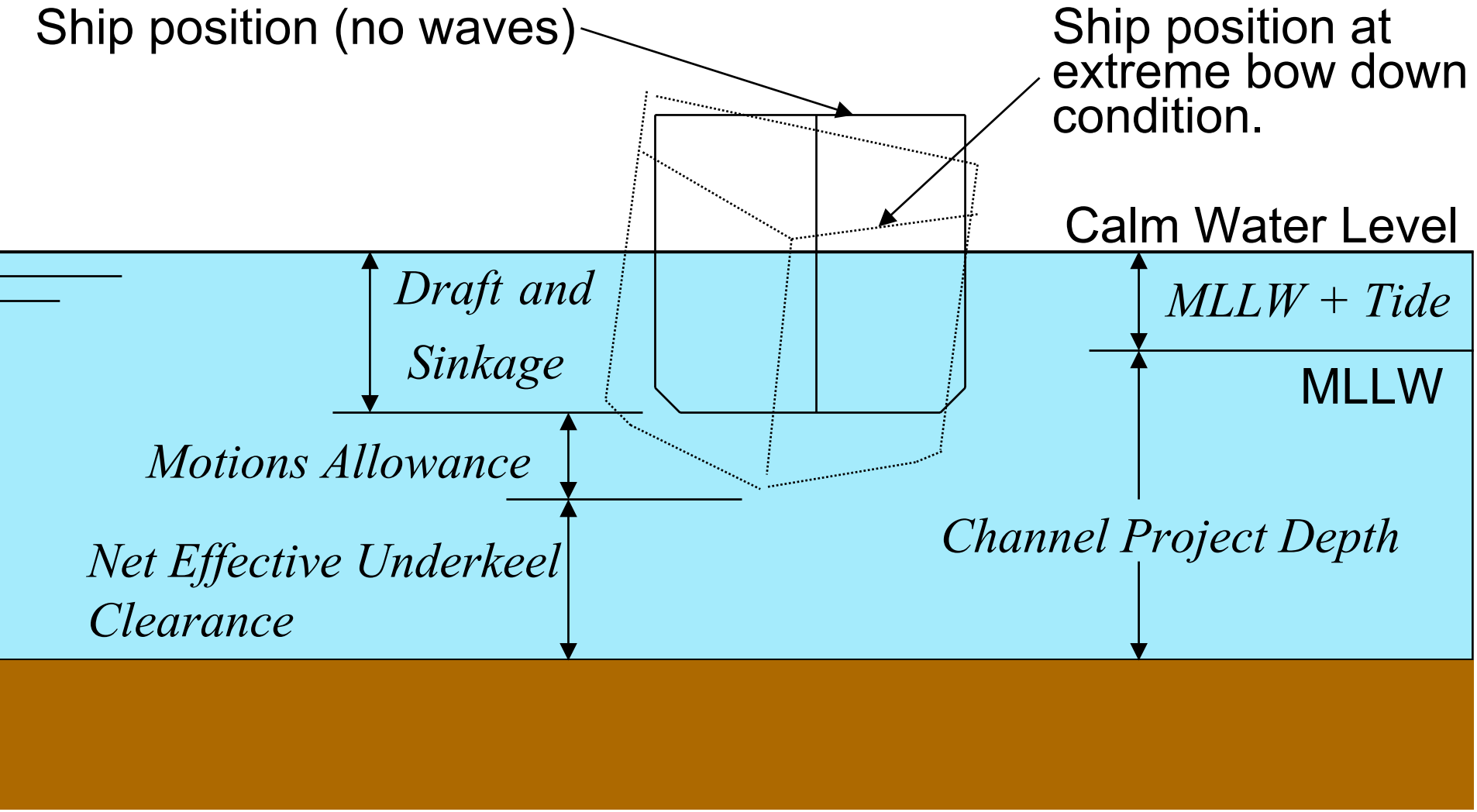
Predict minimum underkeel clearance for:

- Any vessel type
- Any channel configuration
  - Width
  - Depth
  - Orientation
  - Channel Segment Length
- Using meteorological and oceanographic conditions either existing or hypothetical for economic assessment

EMOGS Description

- Installed at two sites and predicts underkeel clearance for two different vessels
- Requires environmental input of the prevailing waves, astronomic and meteorological tide levels, and water depth for MLLW.
- Installed at the first site in 1989 and at the second site in 1995. Both sites are still using EMOGS for every transit.
- Upgraded periodically through the years.

UNDERKEEL CLEARANCE



Required Modifications to EMOGS

- Bundle with software that calculates sinkage and trim and ship response amplitude operators for shallow water
- Add flexibility to channel design
- Add flexibility to wave input

Calibration/Validation

- Field data collected with ships transiting channels using DGPS.
- Water levels, currents, and waves also measured in the field locations
- Laboratory studies conducted to replicate the field measurements
- This database will be compared with model results for calibration and validation

Projected Use of New Capability by Corps of Engineers

- Navigation studies: Planning & Design
- Engineering design of channels: width, depth, and alignment
- Predictor for: squat, trim, RAOs, and UKC
- Module for WES ship simulator
- Ship transit and risk assessment
- Operational tool for USCG and Port Authorities

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